BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H04N 7/50, 7/26

A1

(11) International Publication Number: **WO 99/57910**

(43) International Publication Date: 11 November 1999 (11.11.99)

(21) International Application Number: PCT/FI99/00338

(22) International Filing Date: 27 April 1999 (27.04.99)

(30) Priority Data:
980953 30 April 1998 (30.04.98) FI

(71) Applicant *(for all designated States except US)*: NOKIA MOBILE PHONES LTD. [FI/FI]; Keilalahdentie 4, FIN–02150 Espoo (FI).

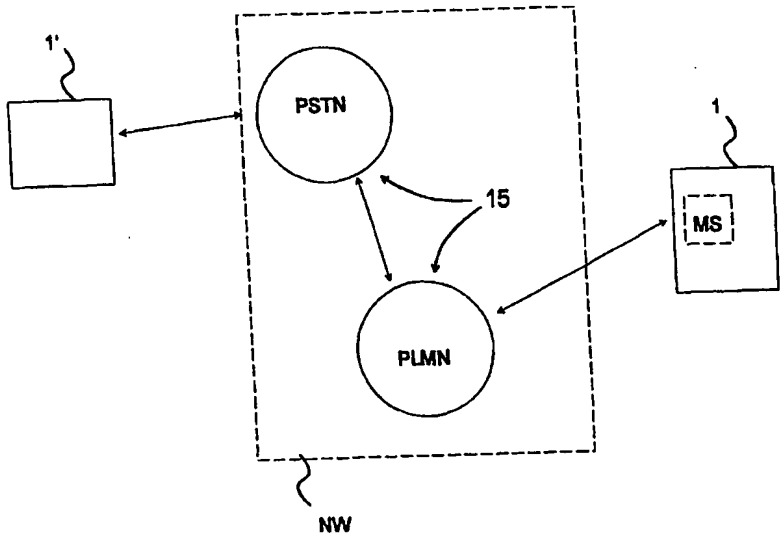
(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: KALLIOKULJU, Juha [FI/FI]; Jokioistentie 5, FIN–37470 Vesilahti (FI). LEHTONEN, Erkko [FI/FI]; Teekkarinkatu 5 A 23, FIN–33720 Tampere (FI).

(74) Agent: TAMPEREEN PATENTTITOIMISTO OY; Hermiankatu 6, FIN–33720 Tampere (FI).

(81) Designated States: AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: A METHOD FOR TRANSMITTING VIDEO IMAGES, A DATA TRANSMISSION SYSTEM AND A MULTIMEDIA TERMINAL



(57) Abstract

The invention relates to a method for transmitting video images between multimedia terminals (1, 1') in a data transmission system. In the video image transmission first video frames (I) are used, in which information encoded from one video image is transmitted, as well as second video frames (P, B) in which information encoded on the basis of two or more video images is transmitted, from which it is possible to generate a video image in the receiver multimedia terminal (1) by using at least one first (I) and at least one second video frame (P, B). In the method, the fast forward or fast rewind function of the video images is performed by transmitting primarily only first video frames (I).

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania
AM	Armenia
AT	Austria
AU	Australia
AZ	Azerbaijan
BA	Bosnia and Herzegovina
BB	Barbados
BE	Belgium
BF	Burkina Faso
BG	Bulgaria
BJ	Benin
BR	Brazil
BY	Belarus
CA	Canada
CF	Central African Republic
CG	Congo
CH	Switzerland
CI	Côte d'Ivoire
CM	Cameroon
CN	China
CU	Cuba
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
ES	Spain
FI	Finland
FR	France
GA	Gabon
GB	United Kingdom
GE	Georgia
GH	Ghana
GN	Guinea
GR	Greece
HU	Hungary
IE	Ireland
IL	Israel
IS	Iceland
IT	Italy
JP	Japan
KE	Kenya
KG	Kyrgyzstan
KP	Democratic People's Republic of Korea
KR	Republic of Korea
KZ	Kazakstan
LC	Saint Lucia
LI	Liechtenstein
LK	Sri Lanka
LR	Liberia
LS	Lesotho
LT	Lithuania
LU	Luxembourg
LV	Latvia
MC	Monaco
MD	Republic of Moldova
MG	Madagascar
MK	The former Yugoslav Republic of Macedonia
ML	Mali
MN	Mongolia
MR	Mauritania
MW	Malawi
MX	Mexico
NE	Niger
NL	Netherlands
NO	Norway
NZ	New Zealand
PL	Poland
PT	Portugal
RO	Romania
RU	Russian Federation
SD	Sudan
SE	Sweden
SG	Singapore
SI	Slovenia
SK	Slovakia
SN	Senegal
SZ	Swaziland
TD	Chad
TG	Togo
TJ	Tajikistan
TM	Turkmenistan
TR	Turkey
TT	Trinidad and Tobago
UA	Ukraine
UG	Uganda
US	United States of America
UZ	Uzbekistan
VN	Viet Nam
YU	Yugoslavia
ZW	Zimbabwe

A method for transmitting video images, a data transmission system and a multimedia terminal

The present invention relates to a method for transmitting video images between multimedia terminals in a data transmission system, in which video images are transmitted by using first video frames, in which information encoded from one video image is transmitted, as well as second video frames, in which information encoded on the basis of two or more video images is transmitted, from which a video image can be formed in the receiver multimedia terminal by using at least one first and at least one second video frame. The present invention also relates to a data transmission system, which comprises means for transmitting video images between multimedia terminals, means for forming first and second video frames from the video images, in which first video frames information encoded from one video image is arranged to be transmitted, and in the second video frames information encoded on the basis of two or more video images is arranged to be transmitted. The present invention relates furthermore to a multimedia terminal, which comprises means for receiving commands, and means for generating first and second video frames from video images, in which first video frames information encoded from one video image is arranged to be transmitted, and in the second video frames information encoded on the basis of two or more video images is arranged to be transmitted.

Multimedia applications are used for transmitting e.g. video image information, audio information and data information between a transmitting and receiving multimedia terminal. For data transmission the Internet data network or another communication system, such as a general switched telephone network (GSTN), is used. The transmitting multimedia terminal is, for example, a computer, generally also called a server, of a company providing multimedia services. The data transmission connection between the transmitting and the receiving multimedia terminal is established in the Internet data network via a router. Information transmission can also be duplex, wherein the same multimedia terminal is used both as a transmitting and as a receiving

terminal. One such system representing the transmission of multimedia applications is illustrated in the appended Fig. 1. Definitions for such a multimedia terminal are presented in the International Telecommunication Union ITU-T Recommendation H.324 "Terminal for Low Bit-Rate Multimedia Communication" (6 February 1998).

The source of information can advantageously be a video application, an audio application, a data application or a combination of these, of which a collective term "multimedia application" is used in this description. In the multimedia application, the user of the multimedia terminal selects the location of the desired source of information, wherein a data transmission connection is established in the system between the selected access location of the information and the multimedia terminal of the user. Data frames, in which the information is transmitted in a digital format, are typically used for transmitting information. A separate data frame is advantageously produced for each different source type, or, in some situations, it is possible to combine data from two or more sources of information into one data frame. In the data transmission system, the data frames are transmitted to the multimedia terminal of the user. In practical applications, these data frames are temporally interlaced, wherein the actual data transmission stream is composed of temporally separated data frames of different applications. There are also systems under development, in which a separate, logical data transmission channel is allocated for different types of applications using, for example, different frequencies or, in CDMA-based systems, different spreading codes. In practice, the data transmission capacity of such data transmission systems is restricted because, for instance, the data transmission channel is physically band restricted and there can be several simultaneous data transmission connections, wherein the entire capacity of the data transmission system cannot be given to the use of any single data transmission connection. In mere audio applications, this does not usually impose a significant drawback, because the amount of information to be transmitted is relatively small. However, in the transmission of video information this restricted bandwidth sets high demands on the data transmission system.

The use of multimedia applications has also been developed in low bit rate data transmission systems, wherein the data transmission rates are in the order of 64 kbit/s, or lower.

The video application can be a TV image, an image generated by a video recorder, a computer animation, etc. One video image consists of pixels which are arranged in horizontal and vertical lines, and the number of which in one image is typically tens of thousands. In addition, the information generated for each pixel contains, for instance, luminance information about the pixel, typically with a resolution of eight bits, and in colour applications also chrominance information, e.g. a chrominance signal. This chrominance signal further consists of two components, Cb and Cr, which are transmitted with a resolution of eight bits. On the basis of these luminance and chrominance values, it is possible at the receiving end to form information corresponding to the original pixel on the display device of the multimedia terminal. In said example, the quantity of data to be transmitted for each pixel is 24 bits uncompressed. Thus, the total amount of information for one image amounts to several megabits. In the transmission of a moving image, several images are transmitted per second, for instance in a TV image, 25 images are transmitted per second. Without compression, the quantity of information to be transmitted would amount to tens of megabits per second. However, for example in the Internet data network, the data transmission rate can be in the order of 64 kbits per second, which makes real time image transmission via this network impossible without the use of compression techniques.

For reducing the amount of information to be transmitted, different compression methods have been developed, such as presented in the ITU-T Recommendation H.263 "Video Coding for Low Bit-Rate Communication", Geneva 1998. In the transmission of video, image compression can be performed either as interframe compression, intraframe compression, or a combination of these. In interframe compression, the aim is to eliminate redundant information in successive image frames. Typically, images contain a large amount of such non-varying information, for example a motionless background, or

slowly changing information, for example when the subject moves slowly. In interframe compression, it is also possible to utilize motion compensation, wherein the aim is to detect such larger elements in the image which are moving, wherein the motion vector of this entity is transmitted instead of transmitting the pixels representing the whole entity. Thus, the direction of the motion and the speed of the subject in question is defined, to establish this motion vector. For compression, the transmitting and the receiving multimedia terminal are required to have such a high processing speed that it is possible to perform compression and decompression in real time.

In several image compression techniques, an image signal converted into digital format is subjected to a discrete cosine transform (DCT) and is subsequently quantised and coded before it is transmitted to a transmission path or stored in a storage means. In this context, the word discrete means that the DCT is calculated using sampled values of cosinusoidal functions, rather than continuous functions.

Using a DCT it is possible to calculate the frequency spectrum of a periodic signal. For example, it is possible to transform the signal from the time domain to the frequency domain. When the discrete cosine transform is applied to a single image, a two dimensional transform is required. Instead of time, the variables are the luminance and/or chrominance values of the pixels in the image. The frequency is not the conventional quantity relating to periods in a second, but indicates e.g. the rate of change of luminance in the direction of the location coordinates X, Y. This is called spatial frequency.

In an image signal, neighbouring pixels typically have substantial spatial correlation. One feature of the DCT is that the coefficients established as a result of the DCT are practically uncorrelated; hence the DCT conducts the transformation of the image signal from the pixel value (i.e. luminance/chrominance) domain to the spatial frequency domain in an effective (efficient) manner.

In an image which contains a large number of fine details, high spatial frequencies are present. For example, parallel lines in the image correspond to a higher frequency, the more closely they are spaced. In general, DCT-components corresponding to diagonally oriented features in an image can be quantized in image processing more without the quality of the image noticeably deteriorating.

In ITU-T Recommendation H.263, Section 4.2.1 "GOBs, Slices, Macroblocks and Blocks" there is described a compression method, in which the DCT is performed in blocks so that the block size is 8 × 8 pixels. The luminance information in the image is transformed with full spatial resolution. Both chrominance signals are spatially subsampled, for example a field of 16 × 16 pixels is subsampled into a field of 8 × 8 pixels. The differences in the block sizes are primarily due to the fact that the eye does not discern changes in chrominance equally well as changes in luminance, wherein a field of 2 × 2 pixels is encoded with the same chrominance value.

The ITU-T RecommendationH.263, Section 4.2.2 "Prediction" defines seven frame types, three of which are mentioned in this application: an I-frame (Intra), a P-frame (Predicted), and a B-frame (Bidirectional). The I-frame is generated solely on the basis of information contained in the image itself, wherein at the receiving end, this I-frame can be used to form the entire image. The P-frame is formed on the basis of the closest preceding I-frame or P-frame, wherein at the receiving stage the preceding I-frame or P-frame is correspondingly used together with the received P-frame. In the composition of P-frames, for instance motion compensation is used to compress the quantity of information. B-frames are formed on the basis of the preceding I-frame and the following P- or I-frame. Correspondingly, at the receiving stage it is not possible to compose the B-frame until the corresponding I-frame and P-frame have been received. Furthermore, at the transmission stage the order of these P- and B-frames is changed, wherein the P-frame following the B-frame is received first, which accelerates the reconstruction of the image in the receiver.

Of these three image types, the highest efficiency is achieved in the compression of B-frames. The appended Fig. 2 presents a data transmission stream, in which these three types of image frames are transmitted. It should be mentioned that the number of I-frames, P-frames and B-frames can be varied in the application used at a given time. It must, however, be noticed here that at least one I-frame must be received at the receiving end, before it is possible to reconstruct a proper image in the display device of the receiver.

In multimedia applications, data transmission in data frame format is also used in the transmission of an audio signal. Thus, both audio data frames and video data frames are preferably provided with identifications, on the basis of which these data transmission streams are connected together at the receiving end. In addition, it has to be possible to synchronize these data transmission streams in order to ensure that the image and the sound are reproduced substantially synchronously.

In an interactive application, the user of the multimedia terminal can control information transmission from the terminal. For example, in situations in which the user wishes to browse the image information faster forward or backward when searching for a desired location, the user enters the fast forward or fast rewind command, respectively, which is transmitted to a server transmitting multimedia information. Thus, the server transmits frames at a faster rate and these are received by the multimedia terminal. However, this fast forward or fast rewind function requires that the server has a high processing speed and a large memory capacity. In addition, the data transmission rate of the data transmission channel has to be sufficiently high to transmit the necessary quantity of information. In all systems this fast forward or fast rewind possibility cannot be implemented using equipment and data transmission channels of prior art. Thus, the user has to follow the multimedia application at normal speed and wait for the desired location to be found. This may take a great deal of time and, on the other hand, unnecessarily load the data transmission system and increase the operating costs.

One purpose of the present invention is to produce a method and a system, in which the fast forward and fast rewind functions are also possible when using data transmission channels with a low bit rate. The present invention is primarily characterized in that in the method the fast forward or fast rewind function of the video images is performed primarily by transmitting only first video frames. A data transmission system according to the present invention is primarily characterized in that the system further comprises means for performing the fast forward or fast rewind function of video images, wherein during the fast forward/rewind function, primarily only first video frames are arranged to be transmitted. A multimedia terminal according to the present invention is primarily characterized in that the multimedia terminal further comprises means for performing the fast forward or fast rewind function of the video images, wherein during the fast forward/rewind function, primarily only first video frames are arranged to be transmitted. The invention is based on the idea that during fast forward/rewind, only intra frames are transmitted. The number and time interval of these intra frames can be adjusted according to the need. Furthermore, it is possible to decrease, if necessary, the information content of these intra images, for example by compressing, reducing the resolution or transmitting them in black and white. Also the transmission of audio information can be interrupted for the time of fast forward/rewind, wherein it is possible to further reduce the amount of information to be transmitted in the fast forward/ rewind.

Considerable advantages are achieved with the present invention when compared with solutions of prior art. With a method according to the invention, it is also possible to implement the fast forward and fast rewind function in systems with a low bit rate without imposing an additional load on the data transmission system. The fast forward and fast rewind function implemented according to the invention does not require the multimedia server to have more processing or memory capacity. In the data transmission system according to the invention, it is also possible to reduce the loading of the system, because the quantity of information transmitted during fast forward/rewind is smaller, and it is possible to reach the correct location in a sequence of video

images faster than in systems of prior art. Thereby data transmission and operating costs are also reduced.

In the following, the invention will be described in more detail with reference to the appended figures, in which

Fig. 1 shows a structure of a data transmission system,

Fig. 2 shows a data transmission stream according to the H.263 recommendation in the transmission of image frames,

Fig. 3 shows a multimedia terminal in which the invention can be advantageously implemented in a reduced block diagram, and

Fig. 4 shows the structure of a transmitting multimedia terminal according to an advantageous embodiment of the invention in a reduced block diagram.

A data transmission system, such as that presented in Fig. 1, comprises a user multimedia terminal 1, a service provider multimedia terminal 1', and a data transmission network NW, such as a telecommunication network. It is obvious that in practical applications there are several user multimedia terminals 1 and several service provider multimedia terminals 1', but with respect to understanding the invention, it is sufficient that the invention is described by means of these two multimedia terminals 1, 1'. Between the user multimedia terminal 1 and the service provider multimedia terminal 1', preferably a duplex data transmission connection is established. Thus, the user can transmit, for instance, information retrieval addresses and control commands to the data transmission network NW and to the service provider multimedia terminal 1'. Correspondingly, from the service provider multimedia terminal 1' it is possible to transmit, for instance, information on multimedia applications to the user multimedia terminal 1.

The block diagram in Fig. 3 presents the multimedia terminal 1, 1' in which the invention can be advantageously implemented in a reduced manner. The terminal in question is suitable for both transmitting and receiving, but the invention can also be applied in connection with simplex terminals. In the multimedia terminal 1, 1' all the functional features presented in the block diagram of Fig. 3 are not necessarily required, but within the scope of the invention it is also possible to apply simpler multimedia terminals 1, 1', for example without data applications 2 and audio means 3. In addition to said data applications 2 and audio means 3 the multimedia terminal also comprises video means 4, such as a video monitor, a video camera or the like. The audio means 3, advantageously comprise a microphone and a speaker/receiver, which is known as such. If necessary, the audio means 3 also comprises audio amplifiers. The data applications 2 are, for example, data files, application programs of a data processor and the like, wherein the data application block 2 can also comprise a data processor (PC, Personal Computer).

To control the functions of the multimedia terminal 1, 1' it comprises a control unit 5, which consists, for example, of a micro controller unit, a micro processing unit, or the like. In addition, the control unit 5 contains memory means MEM e.g. for storing application programs and data and bus interface means I/O for transmitting signals between the control unit 5 and other functional blocks. The multimedia terminal 1,1' also comprises a multimedia block 6, which contains the means needed for encoding/decoding multimedia information and performing data transmission between the multimedia terminal 1, 1' and the data transmission network.

In the transmitting terminal, a video encoding/decoding block 7 conducts the formation of data frames of a video signal to be transmitted, for example, an image produced by a video camera. Some video encoding methods are defined, for instance in the recommendations H.261 and H.263 by the International Telecommunication Union. In the receiving terminal, the procedure is reversed, i.e. an analog video signal is produced from the video data

frames, which is then transmitted, for example, to a monitor or to another display device.

An audio encoding/decoding block 8 performs a corresponding transformation of the audio signal to the data frame format in the transmitting terminal and forms an analog audio signal from the received audio data frames in the receiving terminal. In the receiving terminal audio and video signals are also sychronized by delaying the audio signal in a delay block 9. One audio encoding method is defined in the ITU-T recommendation G.723.1 "Dual Rate Speech Coder for Multimedia Communications Transmitting at 5.3 and 6.3 kbit/s" (March 1996).

A data block 10 conducts protocol modifications for modifying the data to be transmitted into data frames suitable for the data transmission system and, in the reception of data frames, transforms them into data corresponding to the original protocol.

Furthermore, the multimedia block 6 contains a multimedia control block 11, for controlling said video encoding/decoding block 7, audio encoding/decoding block 8 and data block 10, as well as data transmission between the communication network and multimedia terminal 1,1'. The multimedia control block 11 controls, for instance, a multiplexer/demultiplexer 12, by means of which the data frame to be transmitted to the communication system at a given time is multiplexed at the transmitting stage, and at the receiving stage the received data frame is transmitted to the correct processing block 7, 8, 10 on the basis of what kind of information the data frame contains. From the multiplexer/demultiplexer, the data frames to be transmitted are directed to a modem 13, in which the signal is modified to a form suitable for the data transmission channel.

As a data transmission channel, for example a general switched telephone network 15 is used, part of which can be a wireless telecommunication network, such as a public land mobile network, PLMN. In the receiving multimedia terminal 1, 1', a modem converts the

signals coming via the data transmission channel into digital format, if necessary, wherein the signals in digital format are directed via the multiplexer/demultiplexer 12 to the corresponding processing block 7, 8, 10. The modem 13 also comprises a modem controlling block 14, whereby the control unit 5 controls the operation of the modem and the data transmission. It should also be mentioned that for example in GSM communications, the signals are constantly in digital form, wherein the modem 13 is not necessary.

The block diagram of Fig. 4 presents the operation of the multimedia terminal 1' according to an advantageous embodiment of the invention at the transmission stage in audio and video signal transmission. The video encoder 7 (Fig. 3) has constructed video frames of the video signal of the video source, which are stored in a first video frame buffer 16. The first video frame buffer 16 is advantageously provided in the storage means MEM of the multimedia terminal, preferably according to so-called FIFO type (First-In-First-Out), i.e. the data frames are transmitted further in the order written in the buffer. The multimedia terminal 1' is also provided with a second video frame buffer 17 where intra frames are stored, for example by copying from the video frame buffer 16. Another alternative is to store counterparts of the video frames of the first video frame buffer 16 in the second video frame buffer 17, the video frames being generated for example by reducing the resolution. For these video frames, a reference has to be made in the corresponding video frame of the first video frame buffer 16.

In connection with normal video image reproduction, the first video frame buffer 16 is used as a video frame source. Thus, the control unit 5 uses a video buffer selector 19 to select output line OUT1 of this first video frame buffer 16 to be connected further to the multiplexer/demultiplexer 12. In the receiving user multimedia terminal 1, the received data frames are processed and the multiplexer/demultiplexer 12 transmits each received data frame to a decoding block corresponding to its type. Video frames, audio frames and data frames are transmitted to a video encoding/decoding block 7, an audio encoding/decoding block 8, and a data encoding/decoding

block 10, respectively. These encoding/decoding blocks 7, 8, 10 can also comprise a buffer memory for the temporary storing of received frames. It is obvious that even though each encoding/decoding block is presented as one block, in a multimedia terminal intended solely for transmitting or receiving, these encoding/decoding blocks comprise only the corresponding encoders and decoders, respectively.

At the stage when the user wishes to use the fast forward or fast rewind function, the respective command is transmitted from the user multimedia terminal 1, preferably via a logical control channel to the service provider multimedia terminal 1'. The command is received and interpreted in this service provider multimedia terminal 1'. On the basis of the command, in this first advantageous embodiment of the invention, the control unit 5 selects output line OUT2 of the second video frame buffer 17 to be further connected to the multiplexer/demultiplexer 12, wherein the next step is to start transmitting the video frames contained in this second video frame buffer 17 to the data transmission channel. If no actual video frames are stored in the second video frame buffer 17 but only counterparts of the frames stored in the first video frame buffer 16, the video information generated in the fast forward or fast rewind function does not correspond to the original video information completely, but, however, to such an extent that the desired location is discernible in the fast forward/rewind. During the fast forward/rewind, the transmission speed is maintained constant, or it can even be somewhat decelerated, wherein at the receiving stage, the image of these intra frames is established at the rate of reception, which the user sees as the fast forward or fast rewind function.

Furthermore, the audio data frames are provided with an audio buffer 20, from which the audio frames are transmitted to the multiplexer/demultiplexer 12 and, controlled by the control unit 5, further to the communication channel. The system also includes an audio switch 21, which can be used to interrupt the transmission during the fast forward or fast rewind function, which further reduces the amount of information transmitted in the fast forward/rewind.

Moreover, the multimedia terminal 1' in the block diagram of Fig. 4 contains a third video frame buffer 18 to be used in connection with a second advantageous embodiment of the invention. In this embodiment, the quantity of information in the video frames contained in the second video frame buffer 17 is reduced and stored in this third video frame buffer 18. The quantity of information can be reduced, for example, by changing a colour image into a black and white image, wherein the transmission of mere luminance information is sufficient. Another possibility is to reduce the resolution of the image, which is not necessarily even discerned with the eye in the fast forward/rewind. Furthermore, the image can be compressed with a compression method of prior art suitable for intra images. In this solution according to the second embodiment of the invention, in order to generate fast forward/rewind, a video buffer selector 19 is used to select output line OUT3 of this third video frame buffer to be connected to the multiplexer/demultiplexer 12, wherein the quantity of information to be transmitted to the data transmission channel is even smaller than in the system according to the first advantageous embodiment of the invention. At the stage of returning from the fast forward or fast rewind function to normal reproduction, the first step is to retrieve the intra frame so that the normal transmission could be restarted. In this advantageous embodiment of the invention, this intra frame is retrieved from the second video frame buffer 17 which also contains a reference to a corresponding location in the first video frame buffer 16. Thus, the next video frames are retrieved according to normal reproduction from the video frame buffer 16.

Even though the invention is described above primarily in connection with multimedia terminals according to the H.324 recommendation and video encoding according to the H.263 recommendation, it is also possible to apply the invention to implement the video image fast forward and fast rewind function in other terminals and by using other video encoding methods.

Furthermore, in connection with the multimedia terminal 1,1' it is possible to use a wireless communication device MS, wherein data

transmission can be conducted at least partly in a wireless manner. Also, at least some of the functions of the multimedia terminal 1 can be implemented by using the operational blocks of such a wireless communication device MS. As an example of the wireless communication device, the Nokia 9000 Communicator should be mentioned, which comprises, for instance, memory means, a display device, modem functions and a control unit, wherein it is possible to implement the multimedia terminal 1 according to a preferred embodiment of the invention in most respects by modifications made in the application software of the wireless communication device.

The present invention is not solely restricted to the above presented embodiments, but it can be modified within the scope of the appended claims.

Claims:

1. A method for transmitting video images between multimedia terminals (1, 1') in a data transmission system, in which video images are transmitted by using first video frames (I), in which information encoded from one video image is transmitted, as well as second video frames (P, B), in which information encoded on the basis of two or more video images is transmitted, from which a video image can be formed in the receiver multimedia terminal (1) by using at least one first (I) and at least one second video frame (P, B), **characterized** in that in the method there is provided a fast forward or fast rewind function, and that the fast forward or fast rewind function of the video images is performed primarily by transmitting only first video frames (I).

2. The method according to claim 1, **characterized** in that the quantity of information in the first video frames (I) to be transmitted in the fast forward or fast rewind function, is reduced before transmission.

3. The method according to claim 2, **characterized** in that the quantity of information in the first video frames (I) is reduced by reducing the resolution of the image.

4. The method according to claim 2 or 3, **characterized** in that the quantity of information in the first video frames (I) is reduced by compression.

5. The method according to claim 2, 3, or 4, wherein video images contain luminance and chrominance information, **characterized** in that the quantity of information in the first video frames (I) is reduced by transmitting only the luminance information.

6. The method according to any of the claims 1 to 5, **characterized** in that in the encoding of video images, encoding according to the H.263 standard is used.

7. The method according to any of the claims 1 to 6, **characterized** in that the quantity of information is reduced by storing counterparts of said first (I) and second video frames (B, P), said counterparts of said first (I) and second video frames (I, B, P) being formed by reducing the quantity of information of said first (I) and second video frames (B, P), wherein during the fast forward or fast rewind function the counterparts of said first (I) and second video frames (B, P) are transmitted.

8. The method according to any of the claims 1 to 7, wherein audio information is transmitted by using audio data frames, **characterized** in that the transmission of audio data frames is interrupted during the fast forward or fast rewind function.

9. A data transmission system, which comprises means (NW) for transmitting video images between multimedia terminals (1, 1'), means for forming first (I) and second (P, B) video frames from the video images, in which first video frames (I) information encoded from one video image is arranged to be transmitted, and in the second video frames (P, B) information encoded on the basis of two or more video images is arranged to be transmitted, **characterized** in that the system further comprises means for performing fast forward or fast rewind function of video images, wherein during the fast forward/rewind function, primarily only first video frames (I) are arranged to be transmitted.

10. A multimedia terminal (1, 1'), which comprises means (5,13) for receiving commands, and means (13) for generating first (I) and second (P, B) video frames from video images, in which first video frames (I) information encoded from one video image is arranged to be transmitted, and in the second video frames (P, B) information encoded on the basis of two or more video images is arranged to be transmitted, **characterized** in that the multimedia terminal (1,1') further comprises means for performing fast forward or fast rewind function of the video images, wherein during the fast forward/rewind function, primarily only first video frames (I) are arranged to be transmitted.

11. A multimedia terminal (1, 1'), which comprises means (5,13) for receiving commands, and means (16) for storing first (I) and second (P, B) video frames from video images, in which first video frames (I) information encoded from one video image is arranged to be transmitted, and in the second video frames (P, B) information encoded on the basis of two or more video images is arranged to be transmitted, **characterized** in that the multimedia terminal (1,1') further comprises means for performing fast forward or fast rewind function of the video images, wherein during the fast forward/rewind function, primarily only first video frames (I) are arranged to be transmitted.

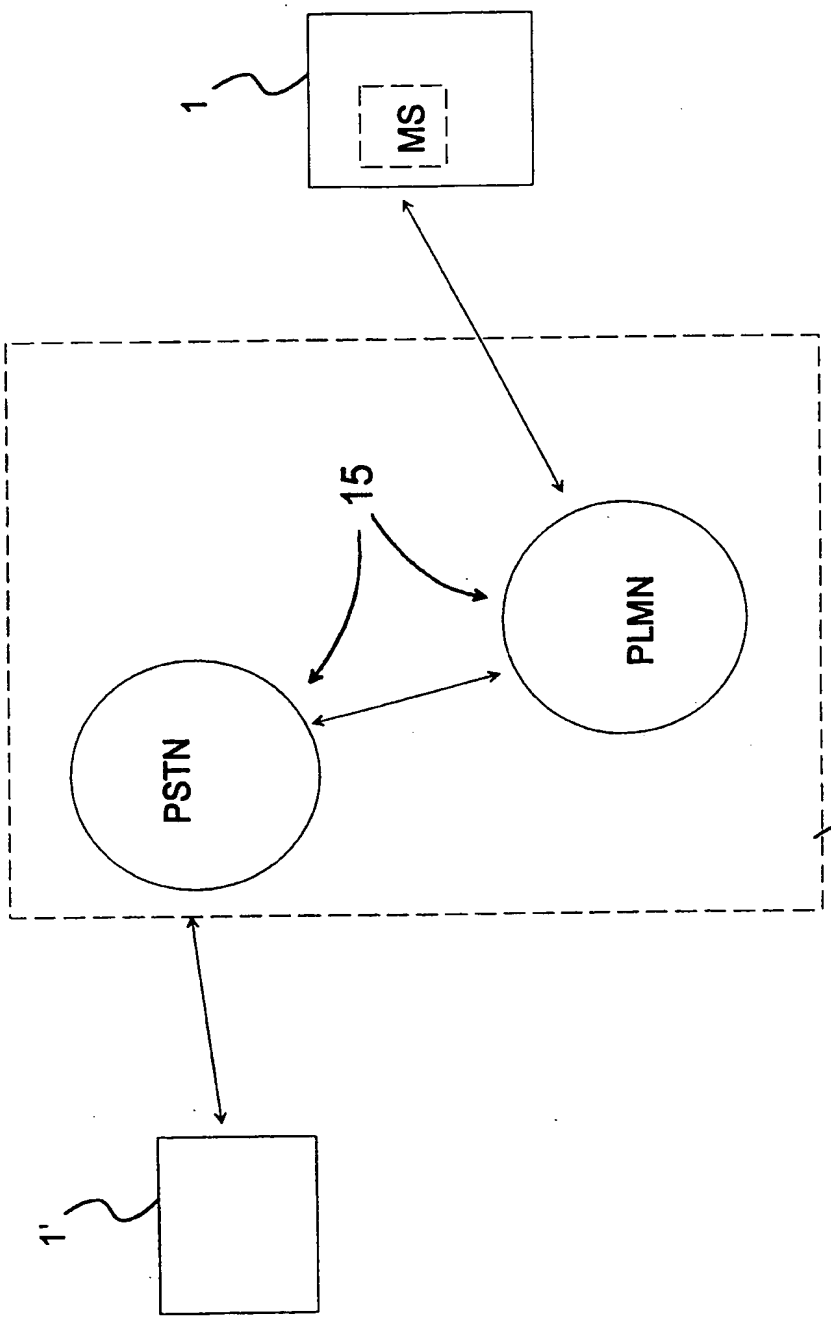


Fig 1

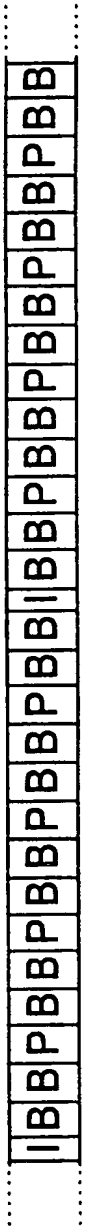


Fig. 2

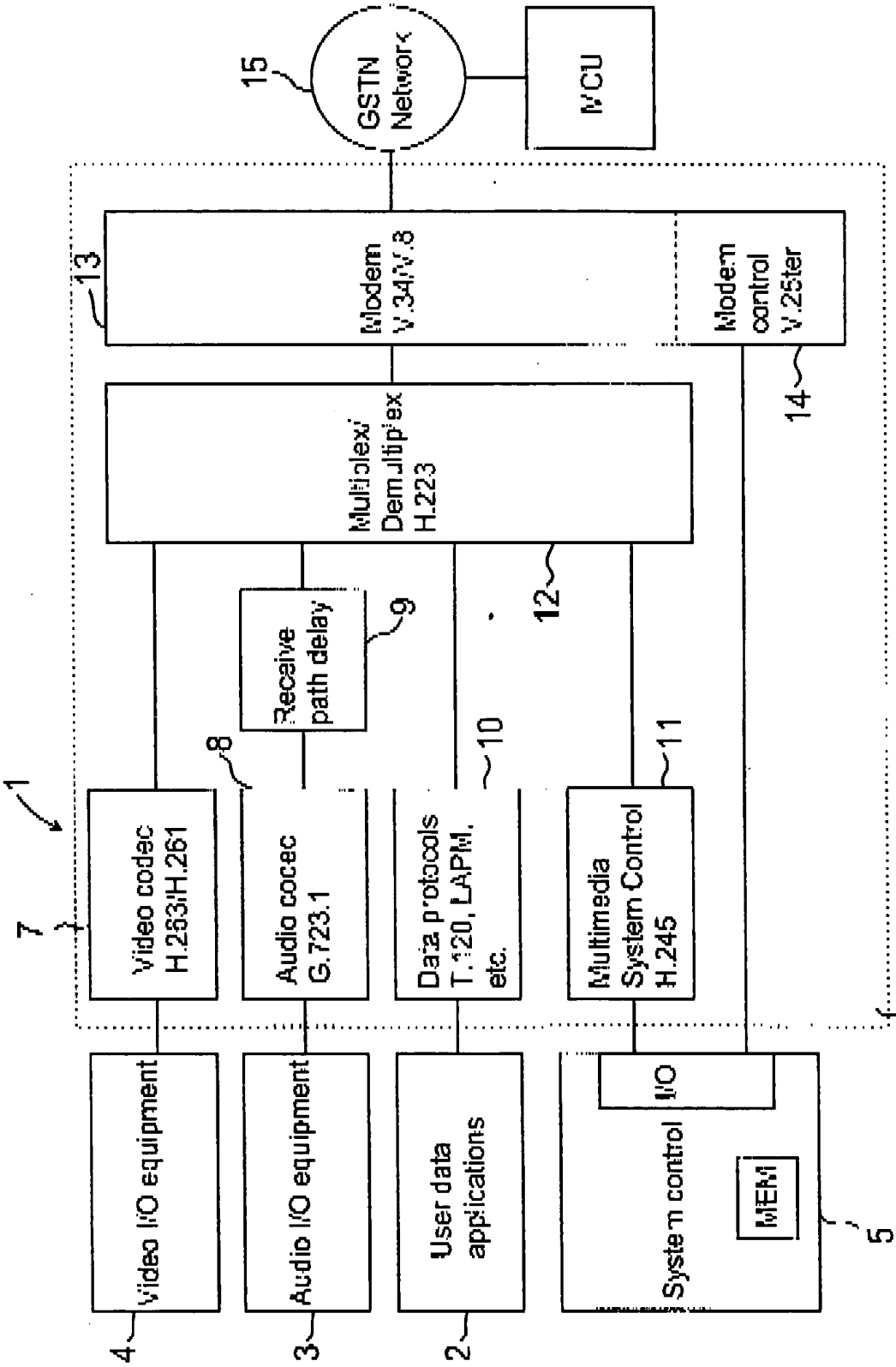

15
GSTN Network
MCU
13
Modem V.34/V.8
Modem control V.25ter
14
Multiplexi Demultiplex H.223
12
9
Receive path delay
8
10
11
1
7
Video codec H.263/H.261
Audio cocec G.723.1
Data protocols T.120, LAPM, etc.
Multimedia System Control H.245
6
I/O
System control
MEM
5
Video I/O equipment
Audio I/O equipment
User data applications
4
3
2

Fig. 3

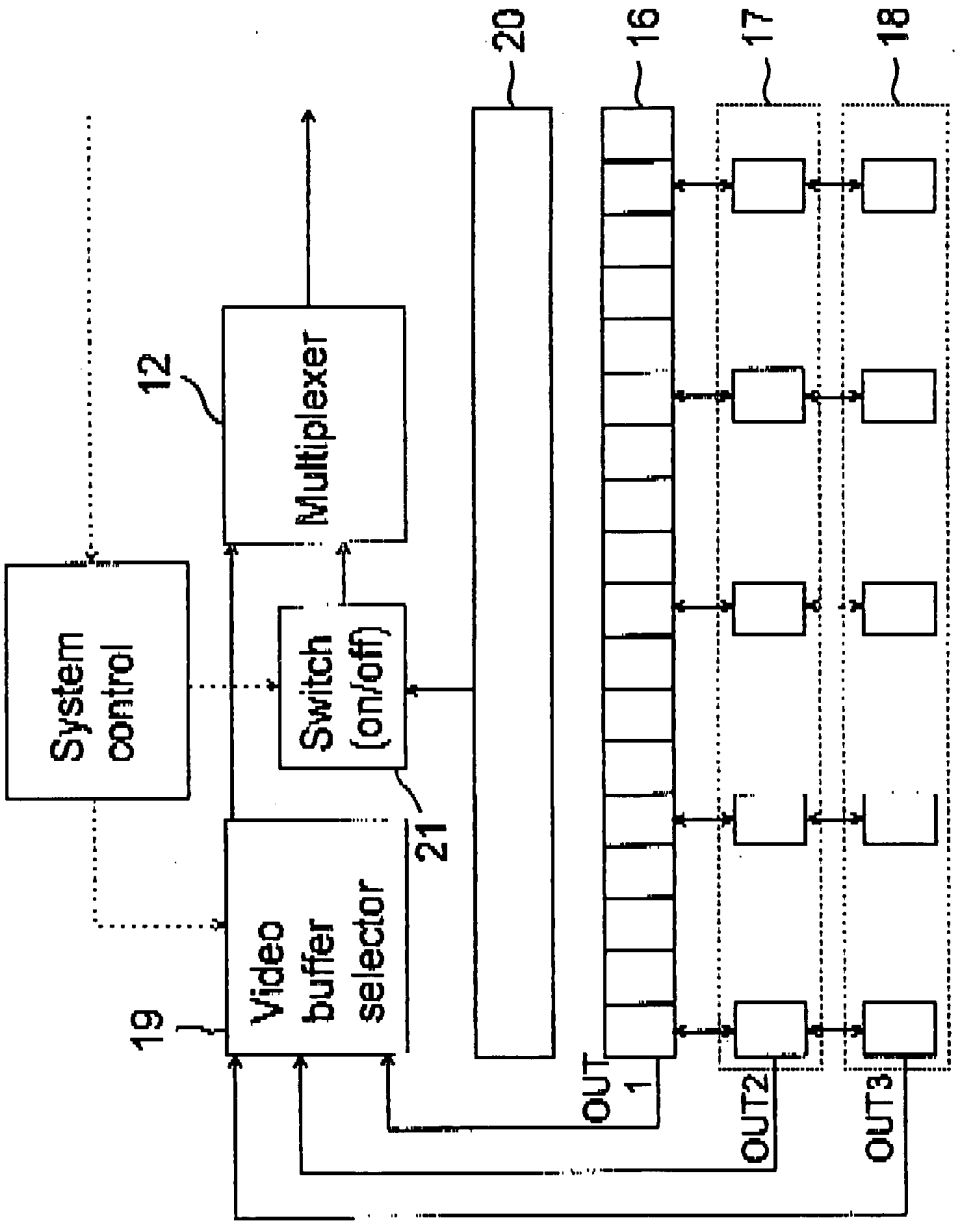

System control
Multiplexer
12
Switch (on/off)
21
Video buffer selector
19
20
16
17
18
OUT 1
OUT2
OUT3

Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 99/00338

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04N 7/50, H04N 7/26
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5576902 A (FRANK A. LANE ET AL), 19 November 1996 (19.11.96), column 6, line 27 - column 8, line 30; column 14, line 19 - line 64; column 27, line 15 - column 30, line 49, figures 5,6,8a,9a,9b, claims 21-24 --	1-11
A	EP 0676898 A1 (INTERNATIONAL BUSINESS MACHINES CORPORATION), 11 October 1995 (11.10.95), see the whole document --	1-11
A	Image Processing, 1995. Proceedings., International Conference on, Volume 1, 1995, Lina Karam and Chris Podilchuk, "CHROMA CODING FOR VIDEO AT VERY LOW BIT RATES", page 562 - page 565, see the whole document --	5

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 October 1999	21 -10- 1999
Name and mailing address of the ISA: Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Erik Veillas/mj Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 99/00338

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5479303 A (HIDEHARU SUZUKI ET AL), 26 December 1995 (26.12.95), see the whole document --	1-11
A	US 5592299 A (JILL M. BOYCE ET AL), 7 January 1997 (07.01.97), claims 1-3 --	1-11
P,X	US 5771335 A (SOUNG HWAN LEE), 23 June 1998 (23.06.98), see the whole document -- --------	1-11

INTERNATIONAL SEARCH REPORT

Information on patent family members

28/09/99

International application No.
PCT/FI 99/00338

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5576902 A	19/11/96	EP 0711084 A	08/05/96
		JP 8214261 A	20/08/96
		US 5673358 A	30/09/97
		US 5377051 A	27/12/94
		US 5778143 A	07/07/98
EP 0676898 A1	11/10/95	AU 674621 B	02/01/97
		AU 8180394 A	12/10/95
		BR 9501428 A	07/11/95
		CA 2142801 A	05/10/95
		CN 1122480 A	15/05/96
		JP 7284042 A	27/10/95
		SG 28234 A	01/04/96
		US 5521630 A	28/05/96
US 5479303 A	26/12/95	JP 2708683 B	04/02/98
		JP 6133262 A	13/05/94
US 5592299 A	07/01/97	US 5684539 A	04/11/97
US 5771335 A	23/06/98	KR 116729 Y	22/04/98
		KR 150702 B	15/10/98